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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/910,886	07/24/2001	Miki Ogawa	35.C15586	3334

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EXAMINER	
BAREFORD, KATHERINE A	

ART UNIT	PAPER NUMBER
1762	

DATE MAILED: 09/03/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/910,886	OGAWA, MIKI	
	Examiner	Art Unit	
	Katherine A. Bareford	1762	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *23 July 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,4-19,24 and 25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Claims 2-3 and 20-23 are canceled

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on July 23, 2004 has been entered.

As requested by the RCE filing of July 23, 2004, the after final amendment of June 1, 2004 has been entered and considered.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 1, 4-19 and 24-25 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Independent claims 1, 2, 12 and 25 have been amended to require that (1) in claims 1 and 25, lines 3-4 that the solution contacting the substrate contains "a hydrolyzed silicon

compound", and (2) in claims 4 and 12, line 4, that a substrate is coated with a solution containing a "hydrolyzed silicon alkoxide", with further reference in the claims to the hydrolyzed compound/alkoxide. Applicant points to pages 11 and 48 of the specification to support this amendment and notes that the claims have been amended to delete the term "partially". The Examiner has reviewed this amendment and the specification, however, there is no support for the addition of a requirement of a "hydrolyzed" silicon compound/alkoxide, either partially or fully hydrolyzed. At page 2, lines 1-3, the phrase "hydrolyzing silicon alkoxide" is present. However, it does not refer to partially hydrolyzing silicon alkoxides, and it is used in referring to previously made materials. At page 2, lines19-20, a "Chemical Comunications" articles is referred to. This article indicates that at one point a partially hydrolyzed TMOS is used. However, this article refers to a process that at page 2, line 18 through page 3, line 5 is referred to as provided films with random pore orientation, which is not desired in the present case. Thus, there is no indication as to why that material would be used in the present process. As to the material on pages 11, 18 and 29, no mention that the materials mixtures must be hydrolyzed is made. While the Chemical Comunications article cited by applicant appears to indicate that a "substoichiometric amount of water" provides for partial hydrolysis, this is not shown by applicant at the coating point. As shown by the material lists provided on pages 18 and 29, before coating occurs a ratio of TEOS:water is provided of 1:5, a ratio provided by Bruinsma (US 5922299) as being above stoichiometric (see column 8, lines 5-8 – a ratio of silica:water or equal to or greater than stoichiometric is desired, and column 3, lines 5-15 – the stoichiometric amount would be TEOS (silica):water of 1:4)), and according to applicant, Bruinsma provides complete hydrolysis.

However, even if Bruinsma provides either partial or complete hydrolysis by using a water amount above stoichiometric, there is no teaching in the present specification that the material must be partially or fully hydrolyzed and thus, there is no teaching of coating with a partially or fully hydrolyzed material in the specification or claims as originally filed. As to reference to page 48, it is unclear what part of the specification is referred to. The Examiner's copy of the specification ends with page 47 (the abstract).

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. Claims 1, 4, 5, 7, 9-13, 15, 17-19 and 24-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruinsma et al (US 5922299) in view of Miyata, et al "Alignment of Mesoporous Silica on a Glass Substrate by a Rubbing Method" (hereinafter "Miyata") and Brinker et al (US 5858457).

Bruinsma teaches a method of manufacturing material. Column 1, lines 10-20. A solution is provided that contains a solvent (water and ethanol), silicon and a surfactant. Column 6, lines 55-65, column 7, lines 20-55 and column 8, lines 50-55. The solution is contacted with a substrate. Column 8, lines 10-25 and 55-65. The coated substrate is dried to remove the solvent

contained in the solution and to form a porous material. Column 8, lines 15-20. The porous material has an ordered channel structure in which the surfactant is held within the porous material. Column 2, lines 15-25, column 4, lines 25-35 and column 9, lines 5-25 (the later calcining burns out the surfactant). Bruinsma also teaches that the silicon compound is to be hydrolyzed prior to coating. Column 6, lines 55-65 and column 8, lines 45-65.

Claim 4: Bruinsma teaches a method of manufacturing material. Column 1, lines 10-20. A solution is provided that contains a solvent (water), silicon alkoxide and a surfactant. Column 6, lines 55-65, column 7, lines 20-55 and column 8, lines 50-55. The solution is contacted with a substrate. Column 8, lines 10-25 and 55-65. The coated substrate is dried to remove the solvent contained in the solution and to form a porous material. Column 8, lines 15-20. The porous material has an ordered channel structure in which the surfactant is held within the porous material. Column 2, lines 15-25, column 4, lines 25-35 and column 9, lines 5-25 (the later calcining burns out the surfactant). Bruinsma also teaches that the silicon compound is to be hydrolyzed prior to coating. Column 6, lines 55-65 and column 8, lines 45-65.

Claim 12: Bruinsma teaches a method of manufacturing material. Column 1, lines 10-20. A solution is provided that contains a solvent (water), silicon alkoxides and a surfactant. Column 6, lines 55-65, column 7, lines 20-55 and column 8, lines 50-55. The solution is contacted with a substrate. Column 8, lines 10-25 and 55-65. The coated substrate is dried to remove the solvent contained in the solution and to form a porous material. Column 8, lines 15-20. The porous material has an ordered channel structure in which the surfactant is held within the porous material. Column 2, lines 15-25, column 4, lines 25-35 and column 9, lines 5-25

(the later calcining burns out the surfactant). After the forming of the porous material the surfactant is removed by calcining. Column 9, lines 5-25. Bruinsma also teaches that the silicon compound is to be hydrolyzed prior to coating. Column 6, lines 55-65 and column 8, lines 45-65.

Claim 19: the substrate can be coated with the solution by a dip coating method. Column 8, lines 15-20.

Claim 24: after the porous material is formed, the surfactant is removed. Column 9, lines 5-25.

Bruinsma teaches all the features of these claims except (1) the patterned application, (2) the pen lithography application and (3) the ink jet application method, (4) the substrate with alignment control ability, (5) the uniaxially aligned channel structure parallel to the substrate, (6) that the substrate is precoated with a polymer compound film subjected to a rubbing process, (7) the non-ionic surfactant, and (8)that the surface of the substrate has a hydrophobic region and a hydrophilic region. However, while Bruinsma teaches a spin coating application method, Bruinsma also teaches that films may also be deposited by spraying, painting or dip coating. See column 8, lines 10-25. The key issue is to provide a coating that has a high surface area to volume ratio. See column 6, lines 55-68 and column 4, lines 15-25. Bruinsma also teaches that the silicon compound is to be hydrolyzed prior to coating. Column 6, lines 55-65 and column 8, lines 45-65. Bruinsma also teaches that various substrates can be used and that it may be advantageous to insure that the substrate surface is hydrophilic. Column 8, lines 10-25. Bruinsma teaches a cationic solvent. Column 7, lines 40-55.

Miyata teaches a method of preparing a porous material, a mesoporous silica. See page 1609, abstract. A substrate is provided. See page 1610 , "Experimental Section". The substrate is provided with a polyimide film that is treated by rubbing (to give alignment control). See page 1610 , "Experimental Section" and the first column. A solution is provided. See page 1610 , "Experimental Section". The solution contains silicon alkoxide and a surfactant. See page 1610 , "Experimental Section". The solution is placed in contact with the substrate. See page 1610 , "Experimental Section". Then after contact, the substrate is dried to remove the solvents contained in the solution. See page 1610 , "Experimental Section". The substrate is also calcined, which removes the surfactant. See page 1610 , "Experimental Section". This provides a coating with an aligned structure. See page 1610. The aligned structure is such that the channels are uniaxially aligned in the "rubbing direction". See page 1610 and figures on page 1611. This provides channels uniaxially aligned parallel to the substrate, since the rubbing direction on the film would be parallel to the substrate.

Brinker teaches a method of preparing a porous material, a mesoporous silica. Column 3, line 60 through column 4, line 10 and column 5, lines 10-55. A substrate is provided. Column 5, lines 25-35. A solution is provided. Column 6, lines 20-40. The solution contains silicon alkoxide (TEOS) and a surfactant. Column 5, lines 10-20. A solvent for the silicon alkoxide and the surfactant is provided in the solution. Column 5, lines 10-30 (note the ethanol and water). The solution is placed in contact with the substrate. Column 5, lines 25-55. The substrate can have an ability to affect the alignment of the resulting channel structures. Column 10, lines 15-50. The coated substrate is dried to remove the solvent to form a material having

aligned channel structures. Column 3, lines 60-65 and column 5, lines 35-50. The surfactant can be cationic or non-ionic. Column 5, line 60 through column 6, line 10.

It is the Examiner's position that pen lithography and ink jet application are well known application methods for applying thin lines of liquid on a substrate. The Examiner notes that ink jet application is a form of atomizing and spraying a liquid. If applicant disagrees, he should so state.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Bruinsma to use a substrate provided with a precoating of a rubbed polymer film as suggested by Miyata to provide a desirable ordered alignment of the coating, because Bruisma teaches the desire to provide an ordered mesoporous silica film, and Miyata teaches a that it is desired to provide an ordered film where the pores are aligned and a desirable substrate to provide such alignment when making aligned mesoporous films. As a result, the combination of Bruinsma and Miyata would provide a the use of substrate with alignment control ability (the substrate precoated with a polymer compound film subject to a rubbing process) and the resulting uniaxially aligned channel structure parallel to the substrate. It would further have been obvious to modify Bruinsma in view of Miyata to use a non-ionic surfactant as suggested by Brinker with an expectation of providing a desirable coated product, because Bruinsma in view of Miyata teaches to provide a porous material from a silicon alkoxide, surfactant and solvent, where the solvent is cationic, and Brinker teaches that when providing a porous material from a silicon alkoxide, surfactant and solvent, the surfactant can desirably be either cationic or non-ionic in order to produce a ordered resulting structure after the evaporation of the solvent. It would

further have been obvious to modify Bruinsma in view of Miyata and Brinker to provide a patterned coating on the substrate by a method such as pen lithography or ink jet coating with an expectation of achieving a desired coating, because Bruinsma teaches that a variety of methods can be used to deposit the coating, as long as it has a high surface to volume ratio including spraying, painting or dip coating, and Brinker also teaches that dip or spin coating can be used, and it is the Examiner's position that pen lithography and ink jet applications would be well known methods that fall within the suggested methods, since pen lithography provides the drawing of thin lines that would fall within the teaching of painting and ink jet is a well known form of droplet spraying. The teaching of methods such as painting would provide a clear suggestion of providing a patterned coating as desired, since the application of a material by painting would be conventionally understood to require a controlled placement of coating at individual portions of the substrate. Furthermore, with the provision of the patterned coating, it would have been obvious to provide a substrate with both hydrophilic and hydrophobic regions, because Bruinsma teaches a variety of surfaces with the teaching that it is desirable to make the substrate surface hydrophilic. With the provision of a patterned coating, it would only be necessary to insure that the area of the substrate to be coated by hydrophilic, and the other parts would desirably be hydrophilic or hydrophobic or neither with an expectation of desirable coating results, since no coating would be applied to those regions.

6. Claims 6 and 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruinsma in view of Miyata and Brinker as applied to claims 1, 4, 5, 7, 9-13, 15, 17-19 and 24-25above, and further in view of MacDougall et al (US 6365266).

Bruinsma in view of Miyata and Brinker teaches all the features of these claims except that the substrate is a silicon single crystal substrate with 110 orientation. Bruinsma does teach that the substrate can be a silicon wafer. See column 8, lines 40-50.

MacDougall teaches applying a coating to a substrate. Column 1, lines 15-20. The coating is in the form of a solution with a silicon alkoxide and a surfactant that is applied to the substrate. See column 2, lines 55-65 and column 3, lines 10-68. The applied coating is calcined to form a mesoporous silica film. See column 6, lines 5-20 and column 1, lines 15-20. The substrate used can be a single crystal silicon wafer. See column 5, lines 5-20.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Bruinsma in view of Miyata and Brinker to apply the coating to a substrate of a single crystal silicon wafer as suggested by MacDougall with an expectation of forming a desirable coated wafer, because Bruinsma in view of Miyata and Brinker teaches a desirable process of forming a coating using a solution with a silicon alkoxide and a surfactant applied to the surface and MacDougall teaches that a desirable surface for forming a coating using a solution with a silicon alkoxide and a surfactant applied to the surface is a silicon single crystal wafer. As to the orientation of the single crystal silicon, MacDougall provides no limitation as to the orientation, and thus, one of ordinary skill in the art would expect desirable results from the various possible orientations. While the teaching of Bruinsma in view of Miyata and Brinker would further

suggest that a rubbed polymer coating would be applied to the surface of this single crystal substrate prior to the coating of the solvent/silicon/surfactant solution, this is not prevented by the claims as worded.

7. Claims 8 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bruinsma in view of Miyata and Brinker as applied to claims 1, 4, 5, 7, 9-13, 15, 17-19 and 24-25 above, and further in view of Fuchs et al (US 5246784).

Bruinsma in view of Miyata and Brinker teaches all the features of these claims except that the substrate is coated with a Langmuir-Blodgett film of polymer compound. Miyata does teach that the substrate is coated with a polyimide film. See page 1610, "Experimental Section". It is desirable for the film to be in the nanometer range. See page 1610, "Experimental Section".

Fuchs teaches applying a coating to a substrate. Column 1, lines 5-20. The coating is a polyimide that is applied to the substrate. See column 1, lines 5-20. The applied coating is applied by a Langmuir-Blodgett technique to form a thin coating, thinner than by a normal spin coating. See column 1, lines 5-30 and column 2, lines 5-65. The coating can be 0.3 to 500 nm. See column 2, lines 60-65. The substrate used can be a silicon wafer. See column 2, lines 35-40.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Bruinsma in view of Miyata and Brinker to apply the polyimide coating to the substrate by the Langmuir-Blodgett method as suggested by Fuchs with an expectation of forming a desirable coated wafer, because Bruinsma in view of Miyata and Brinker teaches a

desirable process of forming an aligned coating using preliminary coating of a polyimide applied to the surface and Fuchs teaches that a desirable method for forming a nanometer thick polyimide coating is by the Langmuir-Blodgett process.

Response to Arguments

8. Applicant's arguments with respect to claims 1, 4-19 and 24-25 have been considered but are moot in view of the new ground(s) of rejection.

Brinker has been provided to teach the use of a non-ionic surfactant in the application process.

While applicant has argued that the use of a non-ionic surfactant provides special advantages over the use of the conventional quaternary ammonium cationic surfactant, providing a coating without microholes, a better controlled pore diameter, and better filling of the mesoporous material with ink, polymer or the like. However, no showing such benefits is provided. The specification provides no examples or comparison to show that non-ionic surfactants provide the claimed benefits over the use of cationic, etc. solvents. Similarly, the discussion in the amendment Remarks section provides no factual showing of the described benefits.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Katherine A. Bareford whose telephone number is (571) 272-1413. The examiner can normally be reached on M-F(6:30-4:00) with the First Friday Off.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on (571) 272-1415. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9306 for regular communications and for After Final communications.

Other inquiries can be directed to the Tech Center 1700 telephone number at (571) 272-1700.

Furthermore, information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KATHERINE BAREFORD
PRIMARY EXAMINER